

Explicit and Tacit Knowledge in the Development and Use of Property Databases

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Chemical technology is increasingly based upon process simulation, and, in turn, reliable simulations are built upon the availability and proper use of accurate and comprehensive property databases. Chemical science and technology has mostly relied upon explicit knowledge. We use the rigorous laws of nature, like the conservation of mass and energy and the second law of thermodynamics to create process models. We develop quantitative correlations using molecular thermodynamics, molecular simulations and accurate data. In this presentation we probe the value of tacit knowledge as a complement to explicit knowledge. Tacit knowledge in the form of informed guesses, hunches and imaginings comes naturally to human beings through experience and immersion in the subject of interest, even though we cannot explain the pathway by which the knowledge is achieved. We cannot compute very rapidly, but we can see and use patterns better than powerful computers. As an example, Dr. Douglas Ambrose, who did fine research on vapor pressure has written: "The eye can see at a glance what may not be easy to deduce from columns of numbers and a few statistical parameters." We actually do exploit tacit knowledge. The developers of the DIPPR 801 database have identified the use of rules of thumb and trends within families as important to the methodology to evaluate experimental data. Component reviews within the research group at BYU and also with industry experts are considered to be essential for the database validation. In this presentation we use examples and case studies to probe and improve the manner in which tacit knowledge may be used to enhance the quality of property databases and the creative ways in which they are used.